Remarks/Arguments

Amendments to the Claims

Applicants have amended Claim 11 to correct an informality. Applicants submit that no new matter has been entered by this amendment.

The Allowance of Claims 1 and 3-10

Applicants graciously acknowledge the allowance of Claims 1 and 3-10.

The Rejection of Claim 11 under 35 U.S.C. §103(a)

The undersigned spoke with Examiner Leykin via telephone regarding the July 24, 2007 Office Action on July 30, 2007. Examiner Leykin confirmed that Claim 11 was rejected under 35 U.S.C. §103(a) and not under 35 U.S.C. §102(b) as set forth in the Official Action of July 24, 2007. Accordingly, Applicants' arguments are directed to a rejection under 35 U.S.C. §103(a) based upon U.S. Patent No. 5,315,218 in view of U.S. Patent No. 6,307,337.

The Primary Examiner has rejected Claim 11 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,315,218 (*Fortune et al.*) in view of U.S. Patent No. 6,307,337 (*Nelson*). Applicants respectfully traverse the rejection.

"There are three requirements to establish a *prima facie* case of obviousness: there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; there must be a reasonable expectation of success; and, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1483 (Fed. Cir. 1991)."

Nelson does not teach using a Hall effect sensor to validate motor movement direction

Amended Claim 11 recites: "A shift motor of a transmission actuator comprising *at least one means for validating the direction of movement of the motor*, wherein said means measures a detected signal current flow, and wherein said means further comprises at least one Hall sensor."

The Examiner has cited *Nelson* as teaching the use of a Hall effect sensor to validate the direction of movement of the motor. However, *Nelson* is solely directed to determining the **position** of a rotor and has no teaching, suggestion, or motivation regarding validation of the **direction** of movement of the rotor. Position is a static parameter unrelated to direction of travel, which is a dynamic parameter. That is, knowing that an object is at a position does not provide any information as to how the object arrived at the position. In the case of a rotating object, knowing that the object is at a certain position does not provide any information as how (in which direction) the object rotated to reach the position.

The following exemplary excerpts from *Nelson* teach the use of Hall effect sensors to teach position only:

"Hall effect devices for providing rotor rotational *position* information to the electronics are connected directly to the control board and extend therefrom to a position adjacent the rotor." (emphasis added) (Abstract and col. 2, lines 22-25).

"The hall effect device has leads connected (soldered) directly to the control board and a sensor portion for establishing an output on at least one of the leads which is representative of a rotational *position* of the rotor core." (emphasis added) (col. 2, line 66 to col. 3, line 3).

"Hall devices for providing rotor rotational *position* information to the electronics are connected directly to the control board and extend therefrom to a position adjacent the rotor." (emphasis added) (col. 3, line 35-37).

In particular, *Nelson* describes two Hall Effect sensors located adjacent a rotor and 180 degrees apart from each other. (Col. 9, Lines 3-6). In this configuration, it is impossible to obtain directional information regarding movement of the rotor. Hall Effect sensors only generate an output pulse when the rotor passes the sensor. Thus, starting at one of the sensors, a half rotation to the other sensor, or a full revolution back to the starting point yields the same outputs from the sensors regardless of the direction of rotation of the rotor.

For example, the interval between outputs from the Hall Effect sensors in a first direction is directly proportional to the rotational speed of the rotor in the first direction and rotational distance between the Hall Effect sensors (180 degrees). In the second direction, the interval between outputs of the Hall Effect sensors will again be directly proportional to the rotational

speed of the rotor and the rotational distance between the Hall Effect sensors (180 degrees). The rotational distance is the same for both direction (180 degrees apart as required by *Nelson*). Then, assuming the rotational speed is the same for both directions, the interval between outputs of the Hall Effect sensors will be exactly the same in both the first direction and the second direction. Therefore, the position of the rotor is detected twice in one revolution and it is impossible to detect the direction of rotation based upon the Hall Effect sensors of *Nelson*. Alternately stated, since the output intervals between the sensors are equal, it is not possible to determine which direction the rotor is turning.

As another example, since there are no intervening sensors or detection points between the two sensors taught by *Nelson*, there is no way to determine if a rotor moving from the first sensor at a 6 o'clock position to the second sensor at the 12 o'clock position has moved through the 3 o'clock position (counterclockwise direction) or the 9 o'clock position (clockwise direction).

Thus, although the position of the rotor when it passes the Hall Effect sensors is obtainable, the direction of movement of the rotor is not obtainable due to the 180 degree arrangement disclosed in *Nelson*. Therefore, *Nelson* fails to teach, suggest, or motivate at least one means for validating the direction of movement of the motor with a Hall Effect sensor as recited in amended Claim 11.

Nelson teaches against using Hall effect sensors to detect direction

The only way that Hall effect sensors can be used to detect rotational direction is if the sensors are asymmetrically positioned, that is, located at other than 180 degrees from each other. However, *Nelson* is directed solely to positioning Hall effect sensors at 180 degrees separation, a configuration from which it is impossible to use the sensors to detect rotational direction.

"A *prima facie* case of obviousness can be rebutted if one of the cited references teaches away from the claimed invention. See *In re Geisler*, 43 U.S.P.Q. 2d 1362, 1366 (Fed. Cir. 1997)."

<u>There is no motivation to make the claimed combination</u>

"The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1483 (Fed. Cir. 1991)."

The Examiner stated: "Hence, it has been obvious to one of ordinary skills in the art, at the time invention was made to use Nelson teaching on use of Hall effect device signals in combination with Fortune et al. shifting device motor control to control directional rotation of motor based on detected motor current. The reason is to prevent motor operation from overload by providing rotational position control of brushless motor according to user demand and prevent motor from rotation when sensed current is above a predetermined level."

Assuming arguendo that *Nelson* taught, suggested, or motivated using Hall effect sensors to detect rotational direction, <u>which is not true</u>, there is no motivation, other than impermissible hindsight for modifying *Fortune et al.* with *Nelson.*

The Examiner has cited the modification of motors 34 and 36 in *Fortune et al.* to include Hall effect sensors to determine rotational direction for the motors. This is completely unnecessary. The direction of rotation for motors 34 and 36 is established by the position of switches 72, 74, 76, 78, 80, and 82, which control current flow to the motors. Therefore, the direction is already known by merely noting the configuration of the switches. Adding Hall effect sensors to confirm what is already known would add needless cost and complexity to *Fortune et al.*

Applicants respectfully submit that redundantly determining direction by adding Hall effect sensors would not provide overload protection. The Examiner gave as a reason: "providing rotational position control of brushless motor according to user demand…" Motors 34 and 36 are used with a shift rail assembly and *Fortune et al.* already provides rotational position control to operate the shift rail assembly. Hall effect sensors would not provide any benefit.

The Examiner also gave as a reason: "prevent motor from rotation when sensed current is above a predetermined level." Determining a direction of rotation has nothing to do with sensing motor current and preventing rotation in the case of current overload. The current generated and sensed by the Hall effect sensors is completely independent of the current that would be sensed

with respect to protecting a motor, that is, the operating current of the motor. The operating current for the motor and the control signal from the sensors are on totally separate circuits and are likely orders of magnitude different. That is, a Hall effect sensor will produce the same current signal when a rotor for a motor passes the sensor regardless of the operating conditions for the motor.

For all the reasons noted above, the combination of *Fortune et al.* and *Nelson* fails to teach, suggest, or motivate all the elements of Claim 11 and fails to provide the teaching or suggestion to make the claimed combination. Therefore, Claim 11 is patentable over *Fortune et al.* and *Nelson.*

Conclusion

Applicants respectfully submit that all pending claims are now in condition for allowance, which action is courteously requested.

Respectfully submitted,

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